DOE/NREL Gearbox Reliability Collaborative
All Members Meeting Agenda

National Renewable Energy Laboratory (NREL) Main Campus
Research Support Facility (RSF) Building, 2nd Floor, San Juan Conference Room
Golden, CO USA
February 7 – 8, 2012

Purpose: The DOE/NREL Gearbox Reliability Collaborative (GRC) has completed Phase 2 testing, which included hundreds of hours of steady state and dynamic loads testing. Selected data sets have been released to the GRC partners to aid in data validation and modeling assumption convergence. The GRC is also planning Phase 3 modeling, analysis, and testing activities to be conducted in the remainder of 2012. Condition monitoring data was collected to feed into a Condition Monitoring (CM) Round Robin analysis by GRC CM partners. The Gearbox Failure Database has been established and is collecting data. Future plans will be discussed with GRC partners and input into those plans will be solicited.

Day 1 Tuesday February 7

7:30 Continental Breakfast (provided by NREL)

8:00 Arrival at RSF, Badging and Check-In

8:30 Welcome (Paul Veers)

- DOE Remarks
- Self Introductions by Attendees
- Overview of the Meeting (Jon Keller)
- History and Current Status (Brian McNiff)

9:30 Phase 1 and 2 Data (Brian McNiff)

- Data Vetting (Brian McNiff) (30)
- Data Visualization and Analysis (Bill LaCava) (30)

10:30 Break

10:45 Modeling & Analysis, Part 1 (Bill LaCava)

- NREL – "GRC Modeling & Analysis Team Activities 2012" (Bill LaCava) (30)
- KU Leuven – "Effect of Flexibility in Wind Turbine Gearbox Dynamics" (Jan Helsen) (30)

12:00 Lunch (provided by NREL)

13:00 Modeling & Analysis, Part 2 (Yi Guo)

- NREL – "Combined Effects of Input Torque, Non-Torque Loads, Gravity, and Bearing Clearance on Planetary Gear Load Sharing" (Yi Guo) (30)
- Romax – "Validation of RomaxWind Model for Carrier Deflection and Sun Orbit" (A Crowther/Z Wright) (30)
- Timken – "Results Overview of Planetary Strain Data" (Chris Marks) (30)

14:30 Break

14:45 Condition Monitoring (Shawn Sheng)

- Durham Univ – "Operational and Functional Performance based on analysis of SCADA data" (Hui Long) (22)
- Kittiwake – "The Difficulties with and Solutions for Remote Machinery Monitoring" (Jack Poley) (22)
- NRG Systems – "Improved TSA Technique for Correcting Main Rotor RPM Variations" (Eric Bechoefer) (22)
- Romax – "Root Cause Analysis Study for Double Spherical Roller Main Bearing Failure in Three Point Mounted Turbine" (Ashley Crowther/Zach Wright) (22)

16:15 Gearbox Failure Database (Mark McDade)

- NREL - Overview and Software Demonstration (Mark McDade) (15)
- Ohio State – "Modeling of Micropitting" (Ahmet Kahraman/Seng Li) (30)

17:00 Adjourn; Optional RSF Tour

18:30 Dinner arranged by NREL (paid by individuals)

Day 2 Wednesday February 8

7:30 Continental Breakfast (provided by NREL)

8:00 Reconvene and Agenda (Jon Keller)

8:15 Phase 3 Plans (Jon Keller)

- NREL – "Phase 1 and Phase 2 History" (Hal Link) (15)
- NREL – "Critical Measurements and Key Tests for Phase 3" (Brian McNiff) (30)
- NREL – "Phase 3 Plan Overview" (Jon Keller) (15)
- GB3 Designer –"Overview of GB3 Design" (Chris Halse) (30)

9:45 Break

10:00 Modeling & Analysis, Part 3 (Bill LaCava)

- CeSOS – "Time Domain Based Gear Contact Fatigue Analysis" (Wenbin Dong) (30)
- Vestas – "Parameter Identification for the Planetary Carrier" (Morten Haastrup) (30)
- Ohio State – "Using Calyx to determine Gear and Bearing Stress Sensitivities to Design and Manufacturing Variations of the GRC Gearbox" (Jason Austin) (30)
- Columbia – "Elastohydrodynamic Lubrication in Geartrain Contacts" (Elon Terrell) (30)

12:00 Lunch (provided by NREL)

13:00 Modeling & Analysis, Part 4 (Yi Guo)

- Durham Univ – "On Building a Reliability Model of the Gearbox" (Hui Long) (30)
- CeSOS – "Drivetrain Modeling for an Offshore Floating Spar-type Wind Turbine" (Yihan Xing) (30)

14:00 GRC Feedback (Jon Keller)

14:30 GRC Breakout Sessions

- Gearbox Failure Database (Mark McDade)
- Condition Monitoring (Shawn Sheng)
- Testing, Modeling and Analysis (Brian McNiff)

15:30 Adjourn, Optional NWTC Tour

DOE/NREL Gearbox Reliability Collaborative Modeling Workshop

National Wind Technology Center (NWTC)
Building 251, Large Conference Room
Golden, CO USA
February 9, 2012

Day 3 Thursday February 9

7:30 Continental Breakfast (provided by NREL)

8:00 Arrival at NWTC, Badging and Check-In

8:30 Welcome (Bill LaCava)

8:45 Rolling Element Bearing Stiffness Matrix Determination Using A Finite Element/Contact Mechanics Model (Yi Guo)

9:30 Wind turbine gearbox planet carrier modeling and analysis in a multibody setting (Yihan Xing)

10:15 Future Planning Session

- Operational modal analysis
- GB3 design modeling
- Model-to-test comparisons

12:00 Lunch (provided by NREL)